HYDROLOGY

Precipitation

Average annual precipitation ranges between 34 and 36 inches (MDNR 1986).

USGS Gaging Stations

There are three active gaging stations in the basin (USGS 1995; <u>Table 1</u>). Water quality is monitored at the South Fabius River station.

Permanence of Flow and Average Annual Discharge

Average annual discharge at the three stations ranges between 278 and 413 cfs (<u>Table 1</u>). All streams are subject to periods of no discharge. Nevertheless, five basin streams denoted by solid blue lines along their entire length on USGS maps are considered to be permanantly flowing streams (Fabius, North Fabius, Middle Fabius, South Fabius, N. Fork of North Fabius). Most other fourth and fifth-order streams have only short reaches considered intermittent. Many third-order streams are intermittent their entire length.

Base Flow and Low-Flow Frequencies

Base flows throughout the basin are not sustained by groundwater inflow during dry weather due to the low conductivity of the underlying clays and rock. Seven-day periods of no flow occur every 5 to 10 years (Skelton 1976; <u>Table 2</u>). Also, stream discharge can fall below 1.5 cfs for 30 days or longer every five years.

Flow Duration

Flow duration statistics reflect the stream discharge that is exceeded for a specified proportion of time. Median discharge (flow exceeded 50% of the time) for the North, Middle, and South Fabius rivers is 41, 47, and 62 cfs, respectively. The ratio of the flow that is exceeded 90% of the time to the flow exceeded 10% of the time (90:10 ratio) is indicative of the flashiness or variability of stream flow. The 90:10 ratios calculated for the Fabius River basin indicate that stream flows are highly variable (<u>Table 1</u>). Small precipitation events cause rapid increases in stream flow; most water runs off quickly due to the low permeability of underlying strata.

Flood Frequency

Alexander and Wilson (1995) determined through multiple regression techniques that drainage area and main-channel slope can be used to estimate flood frequency flows for unregulated streams in Missouri (<u>Table 3</u>). The generalized least squares regression equations are as follows:

 $\begin{array}{c} Q_2{=}69.4A^{0.703}S^{0.373}\\ Q_5{=}123A^{0.690}S^{0.383}\\ Q_{10}{=}170A^{0.680}S^{0.378}\\ Q_{25}{=}243A^{0.668}S^{0.366}\\ Q_{50}{=}305A^{0.660}S^{0.356}\\ Q_{100}{=}376A^{0.652}S^{0.346}\\ Q_{500}{=}569A^{0.636}S^{0.321}\\ \end{array}$ where,

Q_t=estimated discharge in cubic feet per second per time interval (t=years)

A=drainage area in square miles

S=main channel slope in feet per mile

Discharges in excess of 5,000 cfs occur every two years in the major streams of the basin.

Dam and Hydropower Influences

There are no major dam or hydropower influences at this time, except that the regulation of Pool 22 of the Upper Mississippi River by the Corps of Engineers can affect water level and flow in the lower two miles of the Fabius River.

Major Water Users

Seven public water supply facilities in the basin withdraw surface water from 13 small reservoirs (Vandike 1995). Two water supply lakes (LaBelle City Lake and Lewistown Lake) have water quality problems related to the herbicide Atrazine (MDNR 1994). Little water is used for irrigation in the basin (MDNR 1986a). Fewer than 1,000 acres are irrigated in Marion County and fewer than 50 acres are irrigated in each of the remaining counties. There are no major industrial water users in the basin.

Table 1. Stream discharge (cfs) for the period of record at gage locations within the Fabius River watershed (from USGS 1995).

| Location | Instantaneous Peak Flow | Instantaneous Low Flow | Mean | 10% Exceeds | 50% Exceeds | 90% Exceeds | 90:10 Ratio |
|---|----------------------------|---------------------------|------|----------------|----------------|----------------|----------------|
| North Fabius Monticello 1922-1995 | 20,700 | 0 | 296 | 572 | 46 | 4 | 1:143 |
| Middle Fabius Monticello 1946-1995 | 17,700 | 0 | 278 | 587 | 40 | 2.6 | 1:226 |
| South Fabius Taylor 1935-1995 | 19,700 | 0 | 413 | 995 | 62 | 4.1 | 1:243 |

Table 2. Seven-day and 30-day low-flow discharges (cfs) at 2, 5,10, and 20 year recurrence intervals for streams in the Fabius River watershed (from Skelton 1976).

| | Drainage | | | Recurrence Interval (years) | | | | | |
|--------------------------------|------------|------------|------------|-----------------------------|------------|----------|--|--|--|
| Stream | Area (mi²) | Period (d) | 2 | 5 | 10 | 20 | | | |
| North Fabius Memphis | - | 7 | 0.8 | - | 0 | 0 | | | |
| North Fabius Monticello | 452 | 7 30 | 2.1 4.3 | 0.1 0.5 | 0 | 0 | | | |
| Middle Fabius Baring | 185 | 7 30 | 0.1 0.2 | 0 | 0 | 0 | | | |
| Middle Fabius Monticello | 393 | 7 30 | 1.3 2.6 | 0.2 0.6 | 0 0.2 | 0 | | | |
| North Fabius Taylor | 930 | 7 30 | 3.3 7.8 | 0.5 1.2 | 0.1 0.3 | 0 0.1 | | | |
| South Fabius Taylor | 620 | 7 30 | 1.9 4.0 | 0.2 0.8 | 0 0.1 | 0 0 | | | |

Table 3. Flood discharges for 2 to 500 year intervals at stream flow gaging stations in the Fabius River basin (from Alexander and Wilson 1995).

| Stream/ Location | Period of Record | Drainage Area (mi²) | Main Channel Gradient (ft/mi) | Flood Discharge (cfs) for Indicated Recurrence Interval in Years | | | | | | |
|------------------------------------|-------------------------------|---------------------------|--|--|--------|--------|--------|--------|--------|--------|
| | | | | 2 | 5 | 10 | 25 | 50 | 100 | 500 |
| North Fabius Monticello, MO | 1922-93 | 452 | 4.8 | 8,080 | 11,800 | 14,200 | 17,000 | 18,900 | 20,800 | 24,900 |
| North Fabius Taylor, MO | 1929 1931-42 | 930 | 4.0 | 10,600 | 18,700 | 24,400 | 31,900 | 37,400 | 42,900 | 55,500 |
| Middle Fabius Baring, MO | 1931-61 1963-76 1978-86 | 185 | 6.8 | 5,050 | 7,970 | 9,900 | 12,300 | 14,000 | 15,700 | 19,500 |
| Middle Fabius Monticello, MO | 1946-93 | 393 | 4.1 | 5,860 | 9,080 | 11,200 | 13,900 | 15,800 | 17,600 | 21,800 |
| Bridge Creek Br. Baring, MO | 1955-79 | 2.4 | 43.2 | 363 | 585 | 755 | 996 | 1,190 | 1,410 | 1,980 |
| South Fabius Taylor, MO | 1933 1935-93 | 620 | 3.4 | 7,990 | 12,000 | 14,600 | 17,900 | 20,200 | 22,500 | 27,600 |